Art. VII.—*The Rainfall in Victoria.* By R. L. J. Ellery, Esq., F.R.A.S., President of the Royal Society.

In bringing under your notice the records of the rainfall of Victoria, I intended to have referred to some of the causes which appear to govern its distribution, and to have appended a statement of the rainfall in other parts of Australia, but, unfortunately, all the requisite data have not come to hand, so that I shall have to leave this part of the subject for a future paper. It is also a matter of regret, that the records of rainfall in the colony itself are generally too incomplete, or extend over too short a period to render a fair annual average. The rainfall in Melbourne, however, forms an exception, as we possess records from the year 1840 to 1850, and from 1854 to the present date. This break in the series evidently occurred at the separation of this colony from New South Wales, for all the observations made from 1840 to 1850, were published in the New South Wales *Government Gazette.* Any observations, if obtained subsequent to that and prior to 1853 and 1854, cannot yet be found. This is the more unfortunate, for if that gap were filled up, any periodicity or secular diminution of the rainfall, should such exist, might have been traced.

The tables, although incomplete, present some interesting facts worthy of our attention; more especially as the late serious droughts, still existing in some parts, have given to the question of our rainfall a greater significance than, perhaps, it ever before assumed.

The rainfall in Victoria, and probably over the whole surface of Australia (except, perhaps, in the desert parts, if such exist), fully attains to the average of similar latitudes of other parts of the world, and would be adequate to the well-being of the country were it not for the enormous spontaneous evaporation. Of course there are causes which bring about large rainfalls in some localities, while others get none or little. We have whole districts which enjoy a greater humidity than usual, owing in some cases to heavier rainfall, and in many others to a lessened evaporation; but taking Victoria generally, the rainfall is rather above than below the average for similar latitudes.

If we assume the annual average rainfall in Melbourne to be 28·5 inches, which is not far from the truth, we

find it only reaches to about half the annual evapora-
tion, which, according to Professor Neumayer's determinations
and observations since made at the Observatory, amounts to
about forty-five inches per annum. The largest amount of
this evaporation, of course, takes place during our spring and
summer months, with our strong dry winds; in winter the
rainfall exceeds the evaporation by a considerable amount.

An opinion has often been expressed, that there is a kind
of periodicity of seasons in Australia, that dry and wet years
recur at intervals, which, if our observations extended back
far enough, would be found to be in some degree regular. I
think it within the bounds of possibility, that by a long and
systematic record of the rainfall over the Australian conti-
nent, that some rough law would be deduced by which the
recurrence of dry or wet years at stated intervals might be
looked upon as probable. A glance over the diagram
of rainfall in Melbourne for the last twenty-six years,
does not, however, give us much foundation for such
an hypothesis—the missing years come in at an awk-
ward period—that is immediately after the abnormal
rains of 1849—a few more years record subsequent to
our heavy fall of 1863, are also required, when it would be
seen if any similarity existed in the curves immediately
following these very large deflections. Professor Newmayer,
in a very interesting and valuable essay, in the Catalogue of
the Victorian Exhibition, " On the Climatology of Victoria,
states that the average rainfall from 1855 to 1860 differed
but little from the average rainfall for any six consecutive
years, from 1840 to 1848, excluding the abnormal rainfall
of 1849;" but our rainfall of 36·43 inches in 1863, again
thrusts up the curve high above the average, showing that
that of 1849 was not a singular instance, and ought not to
be excluded from the means.

An extended knowledge of our rainfall and evaporation I
feel sure would teach us much that might be done to
mitigate the disastrous consequences of so inadequate a
rainfall as we have just suffered from. And above all, would
point to the necessity of a large and general system of stor-
age. The increased evaporation we are subject to indicates
that the mere collecting the water in reservoirs is not the
only consideration. The ratio of evaporation to the bulk
increases with the surface—the reservoirs should rather be
deep than of large surfaces. The greatest evaporation takes
place during high, and especially high and dry winds—the

reservoirs should be in as sheltered positions as possible, and well planted on their margins. By increasing the number of water stores the amount of evaporation will be considerably lessened, in consequence of a greater humidity of the air. For the same reasons I think it injurious that our inland swamps should be drained, for although they may not, except to a very small extent, benefit the country beyond their immediate vicinity, they raise the dew point very appreciably, more especially at night, over a considerable area about them.

The Table B appended gives the total annual rainfall for Melbourne during twenty-five years, and for shorter periods in other localities in the colony where reliable observations have been made. A few years record of the rain in Adelaide and several localities in South Australia, is also added. The diagram shows graphically the rainfall for Melbourne for the period of twenty-five years, from 1840 to 1865. Table C contains the comparison of the rainfall of Melbourne with that at the Royal Observatory, Greenwich.

The desirability of securing a regular and systematic record of the rainfall over the whole of settled Australia, must be apparent to every practical or scientific man. Observations are required from every area of 500 square miles At present we have only ten localities in this colony where a regular register of the rainfall is kept.

No meteorological instrument is more simple in its construction and use than a rain-guage, and while there is any prospect of adding to our knowledge of Australian climatology, by its more extended use, it should be as common in the hands of our intelligent settlers as a barometer or thermometer.

TABLE B.

Years	Melbourne	Heathcote	Ballaarat	Portland	Camperdown	Beechworth	Echuca	Gabo Island	Wimmera, Longerenong	Ararat	Sandhurst	Cape Otway	Adelaide	Bungaree	Kooringa	Kapunda	Mount Lofty	O'Halloran Hill	Mount Barker	Strathalbyn	Robe Town	Mt. Gambier	Penola	Port Augusta	Mount Remarkable	Hamilton	Aulaby	Glenelg
1840	22·57																											
1841	30·18																											
1842	31·16																											
1843	21·54																											
1844	28·26																											
1845	23·93																											
1846	30·18																											
1847	30·53																											
1848	30·18																											
1849	33·15																											
1850	44·25																											
1851	26·98																											
1852																												
1853																												
1854																												
1855	28·21																											
1856	29·75																											
1857	28·90			27·30																								
1858	26·02	23·79	24·47	31·42			15·76																					
1859	21·80	21·86	23·72	26·31			19·13						20·15															
1860	25·40	19·01	28·80	31·01									20·25															
1861	29·15	28·78	28·66	39·58	27·97	30·87							14·46		9·75		32·00											
1862	22·08	16·99	23·50	31·01	27·60						18·50		18·50		13·98		34·10	24·24										
1863	36·43		37·2	45·31	29·97			32·82	17·26		33·92	49·66	24·03	26·70	17·17	20·20	45·69	30·16	32·00	22·42	33·17	55·69	38·61				21·06	
1864	27·40		24·02	33·06	36·94	29·70		38·74	20·17	23·35	23·03	38·82	21·85	18·03	12·62	20·99	43·32	28·11	22·95	15·75	23·17	32·72	29·45	8·43	18·87	28·07	19·54	20·89
1865	15·94		20·09	34·37	26·16	26·94		49·12	33·08	37·37	10·85	38·02	23·67	27·36	22·55	24·99	56·84	29·86	31·26	22·82	30·69	45·05	40·95	8·26	22·77	32·75	24·35	20·71

TABLE C.

Table showing the number of days of Rain and the amount of Rainfall for every month, and for each year, together with the average number of days of Rain, and average amount for every month for the period from 1858 to 1865.

FOR MELBOURNE.

Years	Jan. Amount in inches	Jan. No. of Days of Rain	Feb. Amount in inches	Feb. No. of Days of Rain	Mar. Amount in inches	Mar. No. of Days of Rain	Apr. Amount in inches	Apr. No. of Days of Rain	May Amount in inches	May No. of Days of Rain	June Amount in inches	June No. of Days of Rain	July Amount in inches	July No. of Days of Rain	Aug. Amount in inches	Aug. No. of Days of Rain	Sept. Amount in inches	Sept. No. of Days of Rain	Oct. Amount in inches	Oct. No. of Days of Rain	Nov. Amount in inches	Nov. No. of Days of Rain	Dec. Amount in inches	Dec. No. of Days of Rain	Year Amount in inches	Year No. of Days of Rain
1858	0·88	9	4·91	12	1·09	9	0·60	11	1·38	15	0·76	13	2·07	18	1·61	16	2·17	22	0·87	10	3·19	11	6·47	12	26·02	158
1859	2·86	13	0·83	10	0·18	8	1·29	8	2·32	14	4·51	21	1·04	13	0·95	17	2·77	16	2·33	13	1·71	12	1·02	11	21·82	156
1860	1·97	10	1·07	4	0·96	6	4·52	12	0·99	11	1·72	16	1·21	9	0·79	10	2·72	17	1·97	15	2·38	12	5·06	11	25·38	133
1861	2·25	14	4·62	13	2·65	9	1·29	11	0·84	12	1·78	16	2·14	16	1·47	14	3·19	17	4·89	14	1·46	11	2·58	12	29·15	159
1862	1·25	4	0·19	3	1·08	8	3·56	14	4·31	19	2·99	16	2·26	20	1·95	14	0·98	14	2·03	11	0·32	9	1·16	7	22·08	139
1863	1·84	9	2·74	13	3·84	14	1·76	10	2·54	16	1·16	10	2·87	16	2·10	18	1·99	15	4·89	18	3·51	13	7·18	14	36·43	165
1864	2·07	7	2·63	2	1·80	7	4·53	18	1·02	9	0·81	10	2·83	13	2·50	18	2·28	14	4·08	8	0·64	9	2·21	12	27·40	144
1865	0·16	3	0·59	8	1·26	3	0·72	7	3·41	18	1·64	10	2·05	14	1·22	14	1·87	13	0·78	8	0·89	7	1·35	9	15·94	119
Average	1·66	8·6	2·20	8·9	1·61	8·6	2·28	11·4	2·10	14·2	1·92	14·0	2·96	14·9	1·57	15·1	2·25	16·0	2·73	13·4	1·76	10·5	3·38	11·0	25·53	147

FOR GREENWICH (ENGLAND) DURING THE PERIOD FROM 1858 TO 1862.

Years	Jan. Amount in inches	Jan. No. of Days of Rain	Feb. Amount in inches	Feb. No. of Days of Rain	Mar. Amount in inches	Mar. No. of Days of Rain	Apr. Amount in inches	Apr. No. of Days of Rain	May Amount in inches	May No. of Days of Rain	June Amount in inches	June No. of Days of Rain	July Amount in inches	July No. of Days of Rain	Aug. Amount in inches	Aug. No. of Days of Rain	Sept. Amount in inches	Sept. No. of Days of Rain	Oct. Amount in inches	Oct. No. of Days of Rain	Nov. Amount in inches	Nov. No. of Days of Rain	Dec. Amount in inches	Dec. No. of Days of Rain	Year Amount in inches	Year No. of Days of Rain
1858	0·76	5	1·72	6	0·82	8	2·34	11	1·99	17	1·24	5	2·97	12	1·53	8	0·88	10	1·36	9	0·45	7	1·67	14	17·78	112
1859	0·80	11	0·86	12	1·35	10	2·17	13	2·35	9	1·43	7	3·26	7	1·13	11	3·80	17	3·00	18	2·90	13	2·17	12	25·59	145
1860	1·81	21	1·10	13	1·85	18	1·00	13	3·90	14	5·80	23	2·80	10	3·68	25	3·10	17	1·60	10	2·50	11	2·75	16	32·0	191
1861	0·55	7	0·78	15	2·21	21	0·83	6	1·83	8	1·90	15	2·18	20	0·59	6	1·49	15	0·89	9	5·06	15	1·25	15	29·4	147
1862	1·79	17	0·46	6	3·55	21	2·84	13	2·84	16	1·93	17	1·69	12	3·01	11	1·61	12	4·08	17	1·02	10	1·63	17	26·3	169
Average	1·14	12·2	1·18	9·6	1·96	15·6	1·84	11·2	2·58	12·8	2·46	13·4	2·58	12·2	1·99	12·8	2·18	14·2	2·31	12·8	2·39	11·2	1·89	14·8	24·48	153